

Notice of Allowability

Application No.

09/595,518

Examiner

Walter F Briney III

Applicant(s)

ROMESBURG, ERIC DOUGLAS

Art Unit

2644

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--
All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS. This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment filed 9 February, 2004.
2. ☒ The allowed claim(s) is/are 1-3, 5-8, 10-21, 23-31, 33-36, 38-48 and 50-52.
3. ☐ The drawings filed on _____ are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☒ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☒ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☒ to Paper No./Mail Date 5.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

DETAILED ACTION

Allowable Subject Matter

Claims 1-3, 5-8, 10-21, 23-31, 33-36, 38-48, and 50-52 are allowed.

The following is an examiner's statement of reasons for allowance:

Following is the original rejection for claim 1:

Claim 1 is limited to a **method for canceling echo for a communications device comprising: storing an existing filter coefficient set**; Laberteaux discloses setting a non-adaptive filter to a default coefficient set (figure 3, step 80 and column 4, lines 60-62). **Periodically calculating a trial filter coefficient set**; Laberteaux discloses adapting the coefficients of an adaptive filter (i.e. trial filter) (column 4, line 66 through column 5, line 6). **Processing an echo-containing signal over a predetermined time period using the existing filter coefficient set to provide a first echo-canceled output signal**; Laberteaux discloses a non-adaptive echo canceller with enough taps to process the length of an echo (i.e. predetermined time period) that uses its loaded coefficients (i.e. existing filter set) to produce an echo replica that is subtracted from an input with echo to produce echo compensated signals (i.e. echo-cancelled outputs) (column 3, line 65 through column 4, line 14). **Processing an echo-containing signal over the predetermined time period using the trial filter coefficient set to provide a trial echo-cancelled output signal**; Laberteaux discloses an adaptive filter (i.e. trial filter) with enough taps to process the length of an echo (i.e. predetermined time period) that uses its coefficients to provide an echo compensated signal (column 3, line 65 through column 4, line 14). Laberteaux discloses calculating

ERLE values involving both the adaptive and non-adaptive filter outputs (column 4, lines 38-57), and discloses that ERLE are averaged over a predetermined number of samples (column 4, lines 54-57 and column 5, lines 7-18). Therefore, Laberteaux has been shown to disclose all limitations of the claim with the exception of **calculating a first energy value of the first echo-canceled output over the predetermined time period; calculating a trial energy value of the first echo-canceled output over the predetermined time period; calculating a trial energy value of the trial echo-canceled output over the predetermined time period**; Sih teaches that ERLE represents the amount of energy that is removed from the echo after it is passed through the echo canceller and should be calculated using short-term energy averages over the value N, which represents the filter order (i.e. predetermined time period) (column 8, lines 27-55 and column 6, line 63). It would have been obvious to one of ordinary skill in the art at the time of the invention to perform energy calculation of the echo-cancelled output signals of Laberteaux using ERLE with short-term energy averages as taught by Sih for the purpose of providing the preferred averaging method of ERLE calculation of Laberteaux. Therefore, Laberteaux in view of Sih have been shown to make obvious all limitations of the claim with the exception of **determining if the echo-containing signal is dominated by echo**; Vähätalo teaches correlating a signal outgoing to a signal path and a returned echo (i.e. echo-containing signal) to determine if an echo exists on the returned echo based on the location of a high correlation between the signal outgoing to the echo path and the returned echo. When the peak of the echo is found, an adaptive filter is centered on the peak of an echo so

fewer filter taps are required to perform an echo cancellation. It would have been obvious to one of ordinary skill in the art at the time of the invention to correlate the near-end speech with echo and the far-end speech of Laberteaux as taught by Vähätalo for the purpose of centering the filters around the peak of the echo to reduce the required number of filter taps to perform echo cancellation. **Updating the existing filter coefficient set with the trial coefficient set where the echo-containing signal is dominated by echo and the trial energy is less than the first energy;** Laberteaux discloses transferring the adaptive filter's (i.e. trial) coefficients to the non-adaptive filter (i.e. existing) coefficients when the ERLE of the adaptive filter is greater than the ERLE of the non-adaptive filter. Because ERLE measurements are inversely proportional to energy (Sih, equations 6, 7, and 8), this corresponds to transferring the coefficients when the adaptive filter's error output is less than the non-adaptive filter's error output. Laberteaux also discloses performing the transfer of coefficients only when the ERLE of the adaptive filter is greater than any previous ERLE recorded. Thus, the transfer will occur when the filter is removing echo that is dominating the input signal better than any other configuration used. Therefore, Laberteaux in view of Sih and in further view of Vähätalo makes obvious all limitations of the claim.

The new limitations require the following analysis in further view of the above rejection:

Claim 1 is further limited **wherein the step of determining if the echo-containing signal is dominated by echo comprises: capturing a predetermined number of samples of an echo-causing signal and the echo-containing signal**

over the predetermined time period; Vähätalo discloses sampling the incoming (i.e. echo-causing) and outgoing (i.e. echo-containing) signals (column 4, lines 9-12) so enough samples exist to model the echo pathway (column 5, lines 47-49). Calculating a correlation function between the echo-containing signal and the echo-causing signal over a correlation window; Vähätalo discloses using these sample vectors to calculate a correlation in a window (Abstract). Calculating a first value using the correlation function over a portion of the correlation window where echo is expected; Vähätalo discloses calculating a highest sum that is a sum of correlation results, and where this maximum sum occurs echo is expected to be present (column 4, lines 4-44). Calculating a second value using the correlation function over a portion of the correlation window where no echo is expected; Vähätalo discloses that after finding the highest sum, those values are set to zero, and a second value is calculated, and that sum should be lower than the previous sum because the echo should have been set to zero, thus no echo is expected where this second sum is calculated (column 4, lines 4-44). Computing a status indicator as a function of the first value and the second value, the status indicator used for determining whether the echo-containing signal is dominated by echo; Vähätalo discloses that when a first calculation is made showing the center of an echo and a second calculation is sufficiently lower than the first (i.e. status indicator) proving the center of an echo (i.e. determining domination by echo).

Claim 1 is also limited wherein the second value is a baseline value and calculating the baseline value comprises calculating a Root Mean Square value of

the correlation function over the portion of the correlation window where no echo is expected. Vähätalo discloses calculating a first max to detect echo (column 7, lines 25-65). After the measurement is determined, a second max is measured with the values constituting the first max being reduced (i.e. no echo is expected). Even though the method for detecting echo disclosed by both the applicant and Vähätalo are essentially similar, the fact that maxes are compared instead of deriving a peak-to-RMS value differentiates the application from the prior art.

Peak-to-RMS measurement is a common metric used for detecting a signal above a baseline, however, the prior art does not teach using such a metric to compare the results of a correlation function in the detection of an echo signal. Therefore, the prior art makes obvious all limitations of the claim with the exception of calculating a **Root Mean Square value of the correlation function where no echo is expected.** Therefore, claim 1 is allowable matter.

It follows that all claims dependent on claim 1 are allowable.

Claims 17, 25, and 44 include the same limitations of the method for determining if echo exists in an echo residual signal as stated in claim 1. Therefore, claims 17, 25, and 44 are allowable for the same reasons as claim 1.

It follows that all claims dependent on claims 17, 25, and 44 are allowable.

Claims 4, 9, 22, 32, 37, and 49 have been cancelled.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

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accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

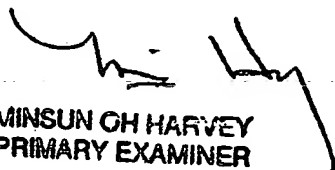
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter F Briney III whose telephone number is 703-305-0347. The examiner can normally be reached on M-F 8am - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester W Isen can be reached on 703-305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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